Optimization of fluoride in water using alum with response surface methodology

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ABSTRACT

Introduction: Fluoride counts an essential element for human health. Therefore, both low and excessive concentrations of that element in drinking water may cause health problems for the consumers. The present study aims to optimize fluoride base in drinking water using Alum response surface methodology.

Methods: The present study is an analytical research which uses surface response method based on Bax Banken model for the optimizing of variable effects in elimination of drinking water fluoride where Spectrophotometer (UNICO-(UV/VIS), model 2150 according to the method of SPADNS presented in standard methods for the examination of water and wastewater has been employed. Three variables of initial concentration of fluoride, PH, and Alum were studied in three levels (+ 1, 0,-1). The required numbers of samples were 17 according to the model. Experimental results were analyzed using Design Expert 7 software. The experiments were carried out randomly in order to the elimination of systematic error. The research data were analyzed using multiple regression and coefficients as well as ANOVA where ($P \leq 0.05$) determined as significant level.

Results: The results showed that initial concentration of fluoride, PH, and Alum are effective in determining the optimal sitaation. Each of these factors increases the efficiency of fluoride elimination to a certain level and after that which the efficiency decreases. In this process optimal conditions included initial concentration of fluoride3.25 mg/L, PH 6.55, and Alum concentration of 166 mg/L where in an efficient condition. Fluoride elimination equal to 76.83% with a desirability of 97.2%.

Conclusion: The results showed good agreement wbetween experimental and model predictions. It can be concluded that response surface methodology is a useful method for optimization of operating factors for the process of coagulation.

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Introduction:

Low and high concentration of fluoride in water is considered a major public health concern. The recommended concentration of fluoride in drinking water is 5.0-1.5 mg/L (1). More than 200 million people in the world are facing problems due to the high concentration of fluoride in drinking water (2). Fluorosis is a disease that caused by a high concentration of fluoride in the body of organisms. This disease has been reported around the world,